US009477387B2

(12) **United States Patent**
Nordstrom et al.

(10) **Patent No.: US 9,477,387 B2**
(45) **Date of Patent: Oct. 25, 2016**

(54) **INDICATING AN OBJECT AT A REMOTE LOCATION**

(71) Applicant: **Google Inc.**, Mountain View, CA (US)

(72) Inventors: **Paul G. Nordstrom**, Seattle, WA (US); **Matthew Amacker**, Santa Clara, CA (US)

(73) Assignee: **Google Inc.**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/748,329**

(22) Filed: **Jun. 24, 2015**

(65) **Prior Publication Data**

US 2015/0370454 A1 Dec. 24, 2015

Related U.S. Application Data

(63) Continuation of application No. 13/853,501, filed on Mar. 29, 2013, now Pat. No. 9,081,473.

(60) Provisional application No. 61/784,372, filed on Mar. 14, 2013.

(51) **Int. Cl.**
G06F 13/00 (2006.01)
G06F 15/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06F 3/04842*** (2013.01); ***G06F 3/0481*** (2013.01); ***G06F 3/0482*** (2013.01); ***G06F 3/04817*** (2013.01); ***G06F 3/167*** (2013.01); ***G09B 19/24*** (2013.01); ***H04L 65/403*** (2013.01)

(58) **Field of Classification Search**
CPC H04N 7/185
USPC 715/700, 761–765, 740–743, 781, 709, 715/748
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,719,622 A * 2/1998 Conway H04N 7/185 340/531
2010/0225450 A1 * 9/2010 Fischer G06Q 10/06 340/10.4
2011/0010644 A1 1/2011 Merrill

FOREIGN PATENT DOCUMENTS

EP 2267595 A4 5/2014

OTHER PUBLICATIONS

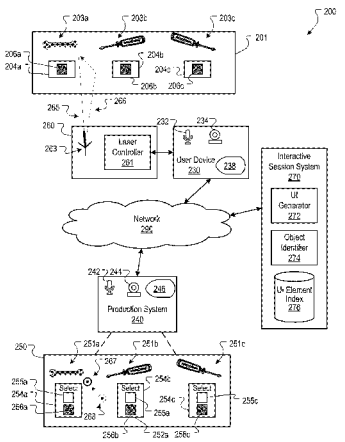
International Preliminary Report on Patentability in International Application No. PCT/US2014/019271, mailed Sep. 24, 2015, 8 pages.
(Continued)

Primary Examiner — Kevin Nguyen
(74) *Attorney, Agent, or Firm* — Fish & Richardson P.C.

(57) **ABSTRACT**

Methods, systems, and apparatus, including computer programs encoded on a computer storage medium, for identifying an object. In one aspect, a method includes receiving an image of a first location. The image depicts a layout of objects located at the first location and a visual code for each object. A user interface is generated for the first location using the image and the codes. The user interface depicts the objects and a user interface element for each visual code. Each user interface element is selectable to identify the object associated with the visual code. The user interface is provided for display at a second location. Selection data is received that specifies a selection of a particular user interface element. Command data is sent to a computer located at the first location, which causes the computer to highlight the object associated with the visual code of the selected user interface element.

18 Claims, 5 Drawing Sheets



(51) **Int. Cl.**

G06F 3/0484	(2013.01)
G06F 3/0481	(2013.01)
G09B 19/24	(2006.01)
G06F 3/0482	(2013.01)
G06F 3/16	(2006.01)
H04L 29/06	(2006.01)

(56) **References Cited**

OTHER PUBLICATIONS

International Search Report and Written Opinion in International Application No. PCT/US2014/019271, mailed Jul. 30, 2014, 10 pages.

Kim, Si-Jung, An Interactive User Interface for Computer-Based Education: The 'Laser Shot System', 2004, 5 pages, Korea Visuals Co., Republic of Korea.

Costanzo, Alessandra, Merging RFID, visual and gesture recognition technologies to generate and manage smart environments, 2011, pp. 521-526, IEEE International Conference on RFID—Technologies and Applications, University of Bologna, Italy.

Gomez, Javier, Towards automatically-generated user interfaces for Ambient Intelligence Environments from 2D codes, 2009, 5 pages, Universidad Autonoma de Madrid.

Jang, Sung Hyun, A QR Code-based Indoor Navigation System Using Augmented Reality, 2012, 7 pages, Centre for Advanced Spatial Analysis, University College London, UK.

* cited by examiner

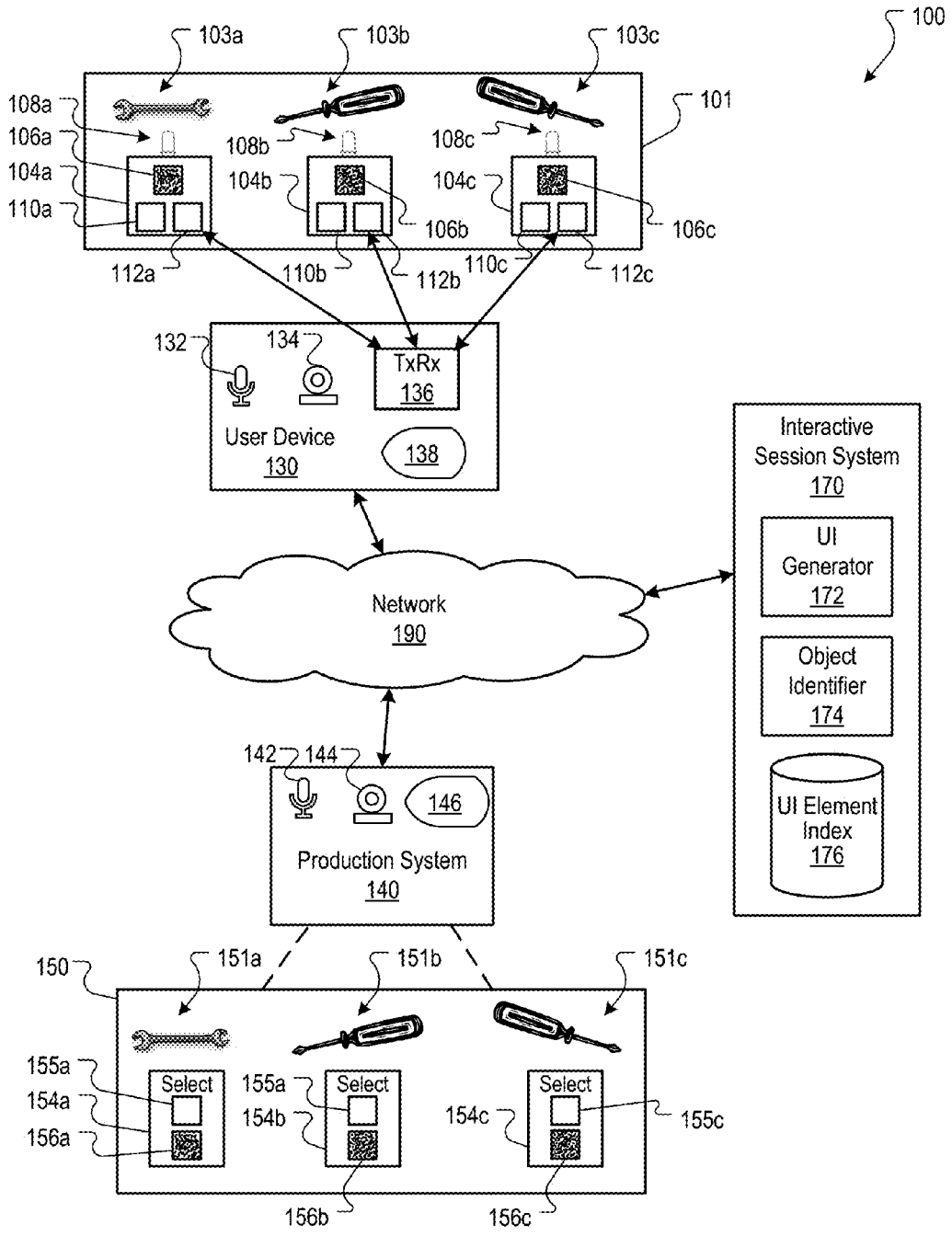

100
103a
103b
103c
101
108a
106a
104a
110a
108b
104b
106b
108c
104c
106c
112a
110b
112b
110c
112c
132
134
TxRx
136
User Device
130
138
Interactive
Session System
170
UI
Generator
172
Object
Identifier
174
UI Element
Index
176
Network
190
142
144
146
Production System
140
150
151a
151b
151c
155a
154a
156a
Select
155a
154b
Select
154c
Select
155c
156b
156c

FIG. 1

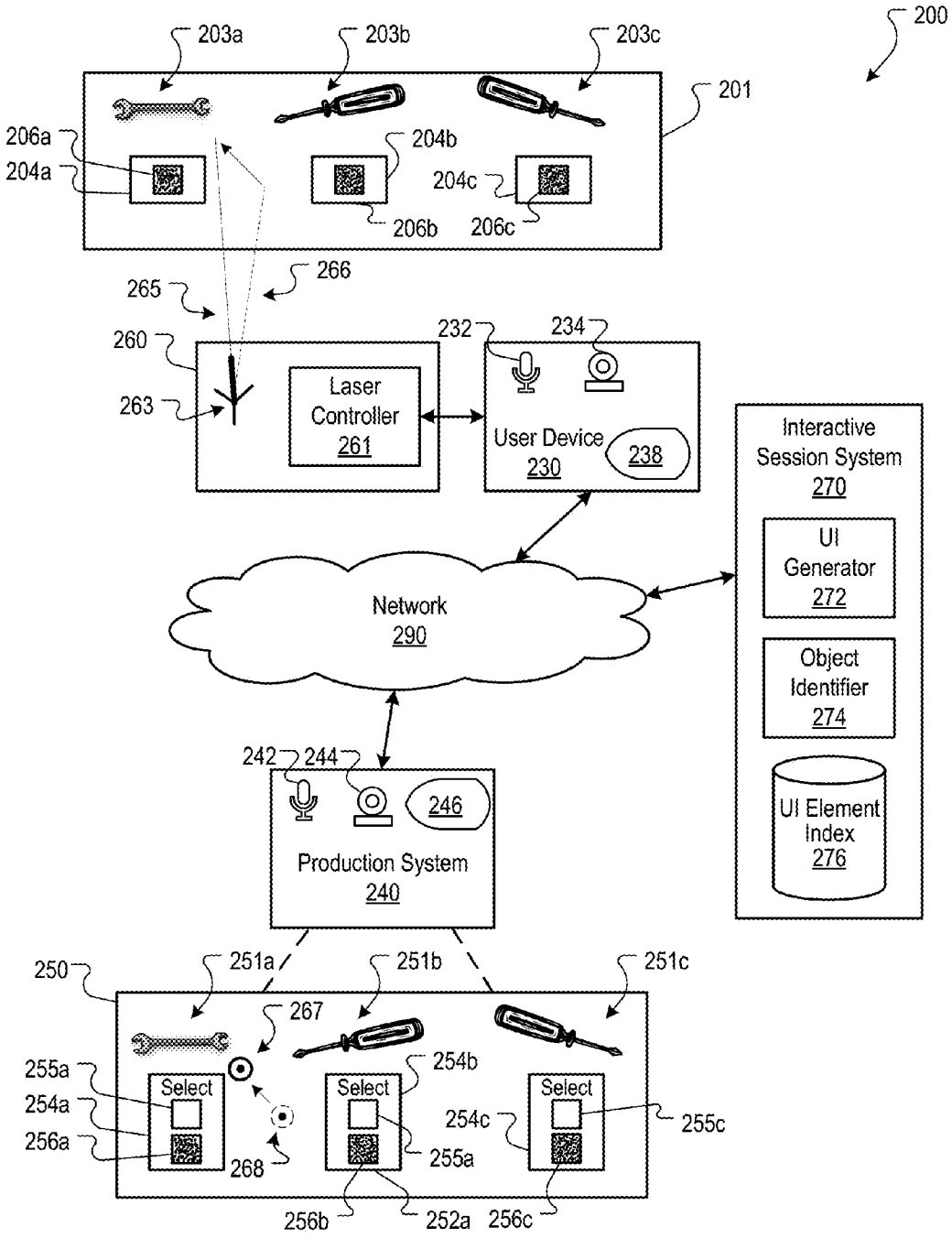

200
203a
203b
203c
201
206a
204a
204b
204c
206b
206c
265
266
260
263
232
234
Laser Controller 261
User Device 230
238
Interactive Session System 270
UI Generator 272
Object Identifier 274
UI Element Index 276
Network 290
242
244
246
Production System 240
250
251a
251b
251c
267
255a
254a
256a
Select
268
254b
255a
254c
255c
256b
252a
256c

FIG. 2

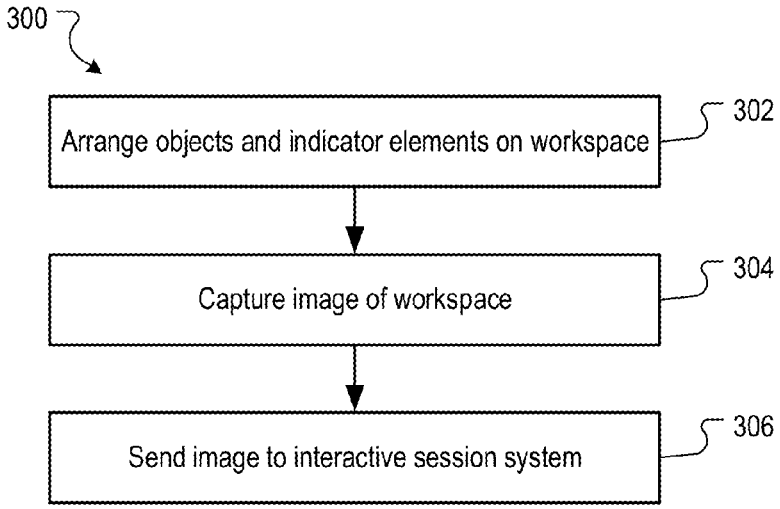

300
Arrange objects and indicator elements on workspace
302
Capture image of workspace
304
Send image to interactive session system
306

FIG. 3

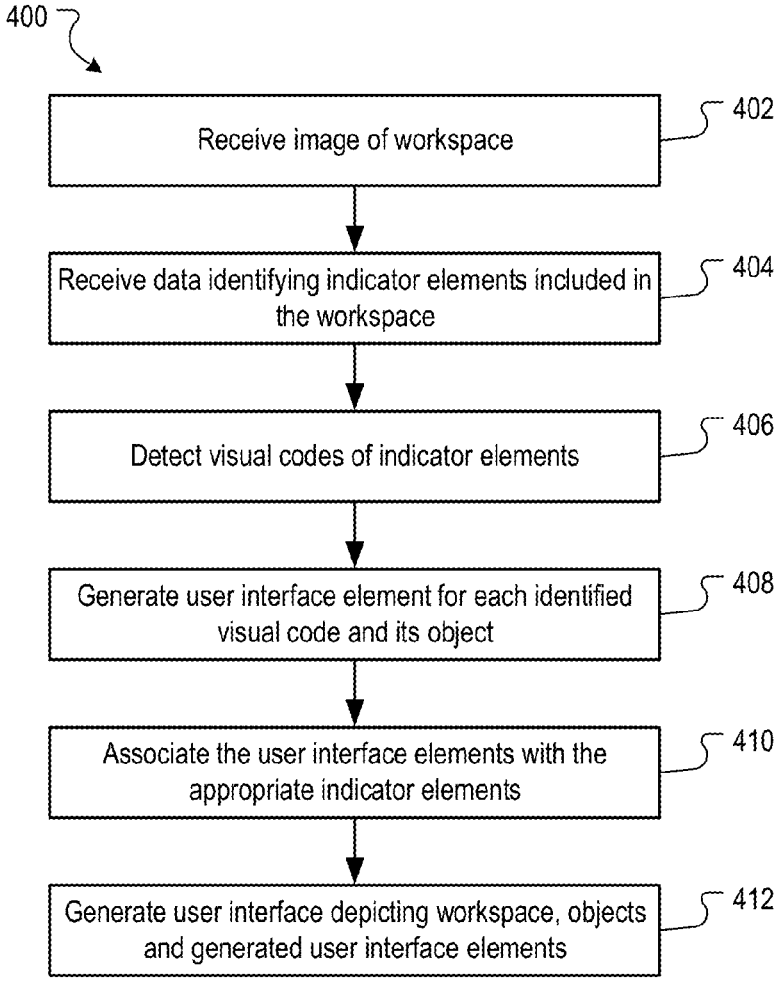

400
Receive image of workspace
402
Receive data identifying indicator elements included in the workspace
404
Detect visual codes of indicator elements
406
Generate user interface element for each identified visual code and its object
408
Associate the user interface elements with the appropriate indicator elements
410
Generate user interface depicting workspace, objects and generated user interface elements
412

FIG. 4

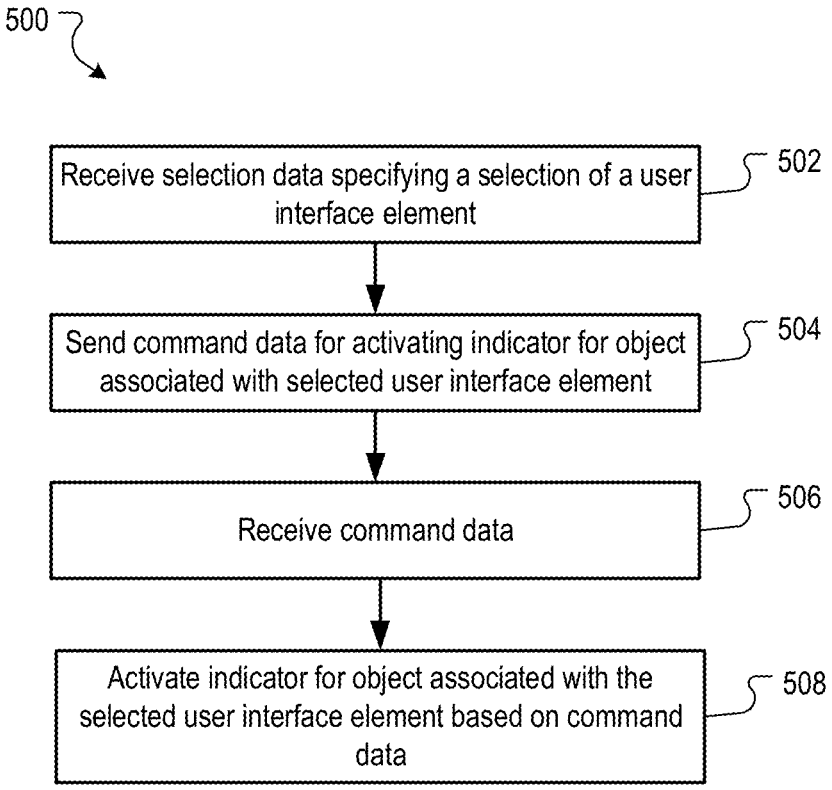

500
Receive selection data specifying a selection of a user interface element
502
Send command data for activating indicator for object associated with selected user interface element
504
Receive command data
506
Activate indicator for object associated with the selected user interface element based on command data
508

FIG. 5

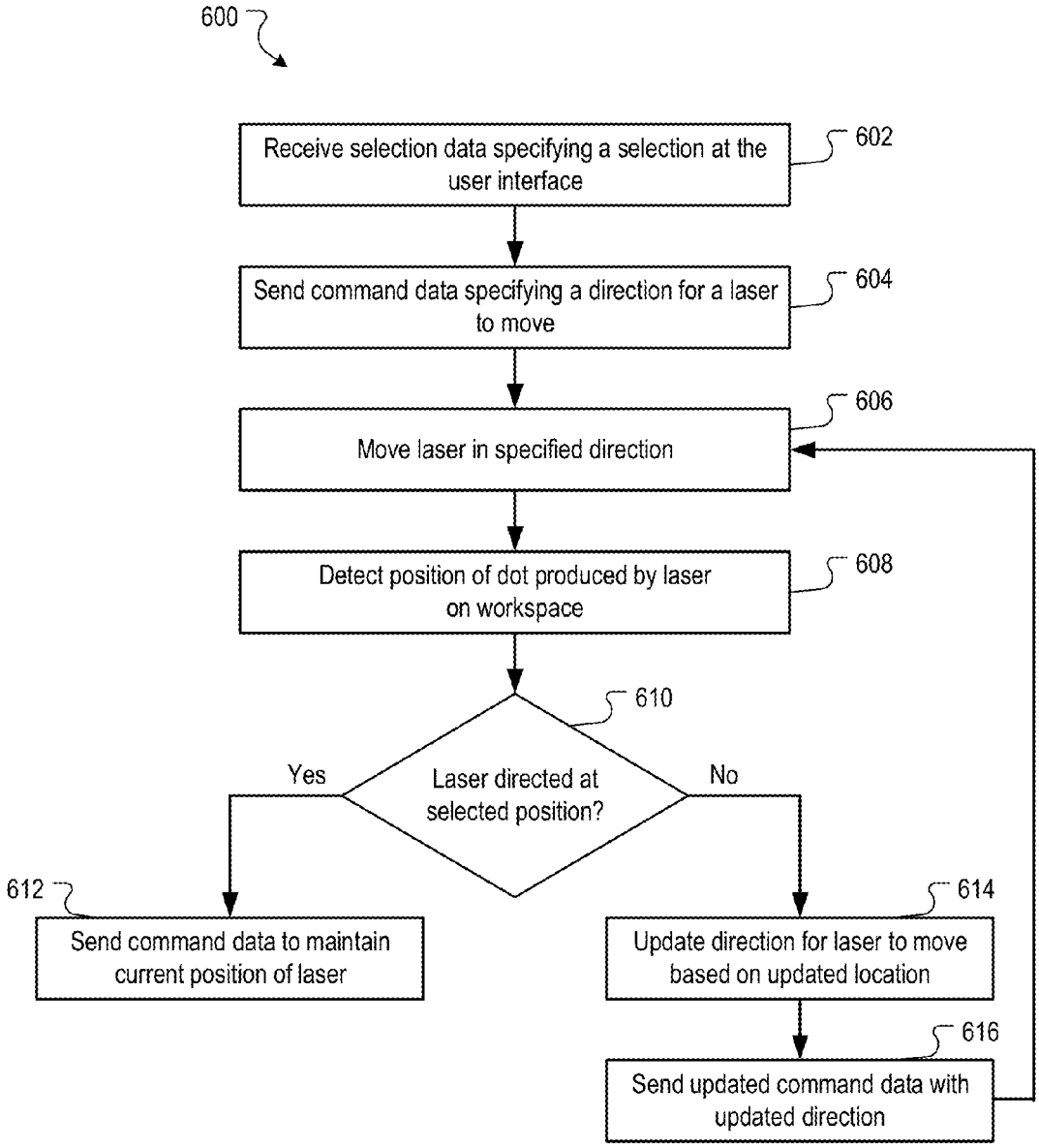

600
Receive selection data specifying a selection at the user interface
602
Send command data specifying a direction for a laser to move
604
Move laser in specified direction
606
Detect position of dot produced by laser on workspace
608
Laser directed at selected position?
610
Yes
No
Send command data to maintain current position of laser
612
Update direction for laser to move based on updated location
614
Send updated command data with updated direction
616

FIG. 6

INDICATING AN OBJECT AT A REMOTE LOCATION

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation application of, and claims priority to, U.S. patent application Ser. No. 13/853,501, titled "Indicating An Object At A Remote Location," filed on Mar. 29, 2013, which claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Patent Application No. 61/784,372 filed on Mar. 14, 2013, titled "Indicating An Object At A Remote Location." The disclosure of the foregoing applications are incorporated herein by reference in their entirety for all purposes.

BACKGROUND

This specification relates to pointing out an object at a remote location.

In many contexts, service providers, tutors, and other entities provide assistance or instruction to users from remote locations. For example, an Internet service provider may have a customer reset a router while diagnosing an issue with the customer's Internet service. This assistance is typically provided over a telephone or another two way communication device. In many cases, it can be difficult for the assistance provider to clearly direct the user to the appropriate object or to explain to the user what needs to be performed.

SUMMARY

In general, one innovative aspect of the subject matter described in this specification can be embodied in methods that include the actions of receiving an image of a first location, the image depicting a layout of objects located at the first location and, for at least one object, a visual code associated with the object; generating a user interface for the first location using the received image and the visual codes depicted in the image, the user interface depicting the layout of objects and a user interface element for each visual code, each user interface element being selectable to identify the object associated with the visual code; providing the user interface for display at a display located at a second location, the second location being remote from the first location; receiving selection data specifying a selection of a particular user interface element displayed in the user interface; and sending command data to a computer located at the first location in response to receiving the selection data, the command data causing the computer to highlight the object associated with the visual code of the selected user interface element. Other embodiments of this aspect include corresponding systems, apparatus, and computer programs, configured to perform the actions of the methods, encoded on computer storage devices.

These and other embodiments can each optionally include one or more of the following features. The computer can highlight the object associated with the visual code of the selected user interface element by activating an indicator for the object. The indicator can include a light positioned near the object associated with the visual code of the selected user interface element.

Generating the user interface for the first location using the received image and the visual codes depicted in the image can include for each particular object: identifying the visual code for the particular object in the image; generating a user interface element for the particular object in response to identifying the visual code for the particular object; positioning the user interface element for the particular object near a depiction of the particular object in the user interface; and associating the user interface element with an indicator for the particular object.

The command data can include data identifying the indicator associated with the selected user interface element. The command data can include data identifying the visual code of the selected user interface element. The computer can identify the indicator associated with the object based on the visual code identified by the command data. The computer can activate the indicator in response to identifying the indicator.

Generating the user interface for the first location using the received image and the visual codes depicted in the image can include detecting the objects in the received image; and providing a label for each detected object in the user interface. The visual code can include a Quick Response Code.

Providing the user interface for display at a display located at a second location can include providing data to a second computer located at the second location, the second computer displaying the user interface. Aspects can further include receiving an image that depicts a portion of the first location, the image further depicting each object associated with one of the user interface elements; and generating the user interface using the received image.

The indicator can include a laser. The command data can cause the laser to direct a beam at the object associated with the visual code of the selected user interface element. Aspects can further include detecting a position of the laser's beam in an image of the first location; and updating the command data based on the detected position.

Particular embodiments of the subject matter described in this specification can be implemented so as to realize one or more of the following advantages. A user can more easily and more quickly direct another user's attention to an object. Training and other interactive sessions can be held more quickly and more efficiently by identifying objects needed for the session in advance and by better directing users' attention to the object needed at a particular time.

The details of one or more embodiments of the subject matter described in this specification are set forth in the accompanying drawings and the description below. Other features, aspects, and advantages of the subject matter will become apparent from the description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an example environment in which an interactive session system provides a user interface for identifying objects at a remote location.

FIG. **2** is another example environment in which an interactive session system provides a user interface for identifying objects at a remote location.

FIG. **3** is a flow chart of an example process for capturing an image of a workspace and sending the image to an interactive session system.

FIG. **4** is a flow chart of an example process for generating a user interface depicting a workspace and user interface elements for objects included in the workspace.

FIG. **5** is a flow chart of an example process for activating an indicator for an object.

FIG. **6** is a flow chart of an example process for highlighting an object with a laser.

Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

Overview

A system can enable users to point out objects at a remote location. For example, the system may be used during interactive sessions where a user at a particular location is instructing another user at another location remote from the particular location on how to accomplish a task. The system makes it easier for the user to point out objects, such as tools, to the other user. For example, rather than the user attempting to describe the object vocally in a way that the other user may understand, the system allows the user to simply activate an indicator element that identifies the correct object.

In some implementations, indicator elements can be placed about a workspace near tools or other objects that are to be used during an interactive session. These indicator elements may each include a visual code, such as a Quick Response (QR) Code, or other identifiable object, a wireless communication device, and an indicator, such as a light or speaker. The system can receive an image or video feed of the workspace with the indicator elements and generate a user interface based on the image and the visual codes. The user interface can include a selectable user interface element for each visual code, and thus for each object. When the user interface element for one of the indicator elements is selected, a command can be sent to the one indicator element that causes the indicator element to activate its indicator.

In some implementations, a laser or other light source is used to highlight selected objects or locations. When the user interface element for an object, or a position of a user interface depicting the object, is selected, the system can direct the laser such that its beam highlights the selected object. A feedback loop can be used to ensure that the laser highlights the correct object or location.

Example Operating Environment

FIG. **1** is an example environment **100** in which an interactive session system **170** provides a user interface for identifying objects at a remote location. A data communication network **190** enables data communication between multiple electronic devices. Users can access content, provide content, exchange information, and participate in conversations and interactive sessions by way of the devices and systems that can communicate with each other over the network **190**. The network **190** can include, for example, a local area network (LAN), a cellular phone network, a wide area network (WAN), e.g., the Internet, or a combination of them.

A user device **130** is an electronic device, or collection of devices, that is capable of communicating over the network **190**. Example user devices **130** include personal computers, mobile communication devices, smart glasses, and other devices that can send and receive data over the network **190**. A user device **130** typically includes a user application, e.g., a web browser that sends and receives data over the network **190**, generally in response to user actions. The web browser can enable a user to display and interact with text, images, videos, music and other information typically located on a web page at a website on the world wide web or a local area network.

In general, a user device **130** can include an audio input device **132**, a video input device **134** and/or still image input device, a wireless communication device **136**, an optional display device **138**, and/or optionally other input devices and output devices. The audio input device **132** can enable a user to communicate with another user over the network **190**. The video input device **134** can capture a video stream and/or still images, for example of a workspace **101**. The video input device **134** may include a depth camera that can generate three dimensional images.

The wireless communication device **136** can include a wireless transceiver for communicating wirelessly with other devices. For example, the wireless communication device **136** can include a modem, a Wi-Fi transceiver, a Bluetooth transceiver, a Zigbee transceiver, and/or other wireless communication module. The term "transceiver" is used in this specification to refer to a transmitter and/or receiver.

An interactive session system **170** is also accessible by user devices **130** over the network **190**. The interactive session system **170** serves interactive sessions and data related to interactive sessions to users of user devices **130**. The term "interactive session" is used in this specification to refer to a presentation that allows a user to experience an event or receive data related to the event. Events of different types can be presented. In some implementations, events may be "assistance" events, for which interactive sessions provide step-by-step assistance to users to accomplish a particular task, or events may be "experience" events, for which interactive sessions provide users with an experience of participating in an activity. An example interactive session for an assistance event is a session that describes a step-by-step process to build a computer. An example interactive session for an experience event is a session that provides the experience of driving a certain make and model of an automobile. The interactive session system **170** may also provide interactive sessions for other appropriate event types.

Furthermore, the data that the interactive session system **170** provides for an event may also differ based on the event type and based on the intent of the user. For example, interactive sessions for repair events may provide users with a list of tools and parts required to accomplish a task at the beginning of an interactive session. Likewise, a user may have implicitly or explicitly specified an intent for viewing an interactive session. The user may explicitly specify an intent, for example, by interacting with a user interface element that represents their intent. A user may implicitly specify an intent, for example, by submitting a search query that is related to the intent, or by requesting other information that is related to the intent. For example, a user request for information about purchasing tools needed to repair a computer may be considered an implicit indication of the user's intent to repair a computer.

The interactive session system **170** may also determine specific data to provide based on the intent. For example, a user that is viewing a session that describes building a computer, and with the intent to build the computer, may be presented with additional information, e.g., a list of parts, tools and the time required to complete the task. Another user that is watching the same session with the intent to learn about computers may be presented with other information, e.g., articles about memory, heat dissipation, or other computer related topics, in a side panel of a viewing environment as the interactive session is presented.

The interactive sessions can be created by assistants, such as expert assistants, or non-expert users. An "assistant" can be a user or entity that has been accepted by the system **170** for a category, e.g., as a result of the user's or entity's having provided credentials or demonstrated a high level of skill. An "expert assistant" may be an assistant with a high level

of skill or expertise in a particular area. Examples of expert assistants include a licensed contractor for construction related videos or a company that produces sessions for a particular product the company manufactures and a user that has produced a large number of highly rated sessions. An assistant does not have to have a particular level of skill or have produced a large number of highly rated sessions. For example, an assistant may simply be a friend or acquaintance of another user that knows how to accomplish a task, such as programming a universal remote control. This assistant and the other user can participate in an interactive session where the assistant helps the other user program a universal remote control.

In some implementations, a content item management system (not shown) can provide content items with the interactive sessions. In the case of advertisements, the content item management system may select advertisements based on the subject matter of a session, the event type, and the user's intent. For example, for a repair event, the content item management system may provide advertisements for providers of tools and parts that are listed in the list of tools and parts required to accomplish the repair task.

The interactive session system **170** includes a user interface generator **172**, an object identifier **174**, and a user interface element index **176**. The user interface generator **172** generates user interfaces based on an image or video feed. For example, the user interface generator **172** may generate a user interface based on an image or video feed of the workspace **101**, as described in more detail below.

The object identifier **174** is used to identify objects depicted in an image or video. For example, the object identifier **174** may detect tools or other objects depicted in an image of the workspace **101**. The objects can be detected using vision and image processing technologies. A label or annotation describing each detected object can be included in the user interface. For example, if a hammer is detected in an image or video, a label including "hammer" may be depicted in the user interface near the depiction of the hammer.

Production systems **140** can be used to create sessions. Production systems **140** may range from studios to smartphones to simple hand-held video recording systems. Generally, a production system **140** is a system that includes an audio input device **142**, a video input device **144**, a display device **146**, and/or optionally other input and output devices and production processes that are used to create sessions. For example, post production processes may be used to add metadata to an interactive session. Such metadata may include, for example, keywords and topical information that can be used to classify the session to one or more topical categories; a list of tools and parts required for a particular session and descriptions of the tools and parts; and so on.

Tactical sensory input devices may also be used in a production system **140**. For example, a particular interactive session may provide input data for a "G-suit" that applies pressure to a user's body and that the user interprets as simulated motion. Accordingly, appropriate input systems are used in the production system **140** to generate and store the input data for the interactive session.

Production systems **140** may also be or include devices that are attached to a person. For example, for "point of view" sessions, wearable computer devices that include a camera input device and microphone input device may be worn on a user's person during the time the user is creating the session.

A user experiences a session by use of a user device **130**. Other types of input and output devices may also be used, depending on the type of interactive session. For example, an augmented reality visor that provides a view of a real-world environment augmented by computer-generated graphics may be used. A tactical sensory input device and a tactical sensory output device that applies pressure to a user's body and that the user interprets as simulated motion or other type of feedback may also be used.

Some interactive sessions may be provided as part of a consultation process, for example when the user cannot find a stored interactive session that fulfills the user's informational needs. To illustrate, an automobile mechanic may contact a user at another location, e.g., the user's home, to consult with the user regarding an automobile repair. The automobile mechanic may then explain to the user, by means of an interactive session that highlights certain parts of the automobile engine as seen from the point of view of the automobile mechanic, certain repairs that are necessary and request authorization from the user to proceed. The user can ask questions and discuss alternatives with the automobile mechanic during the interactive session to make an informed decision.

Although the interactive session system **170** is depicted as a separate system in FIG. **1**, in some implementations the interactive session system **170** is part of the user system **130** and/or the production system **140**. For example, the production system **140** and/or the user device **130** may include a user interface generator **172** that generates the user interfaces. In some implementations, the interactive session system **170** is a third party system accessed by the user device **130** and the production system **140**. A third party interactive session system **170** may provide user interfaces to the user device **130** and the production system **140** so that the user of the user device **130** and the user of the production system **140** can interact with the interactive session system **170** and/or each other.

User Interfaces for Identifying Objects

As described above, a user may be presented with a list of parts, tools, or other objects that are required to complete a task during an interactive session. This can decrease the amount of time required to complete an interactive session as the user does not have to search for tools while the session is in progress. However, it may be difficult for an assistant to describe the tool or part required at a particular time. For example, there may be several versions of a screwdriver required during an interactive session. If the differences between the screwdrivers are not obvious, the assistant may resort to saying things like "the fifth tool from the left," or "you're getting warmer, but further to the left." This can be frustrating to the user and/or the assistant, and can lengthen the time required to complete the interactive session.

The interactive session system **170** can generate a user interface for a workspace **101** that makes it much easier for the assistant to point out objects to the user. For ease of subsequent discussion, the example environment **100** is described with reference to a user operating the user device **130** and being located at a first location, and an assistant operating the production system **140** at a second location remote from the first location. For example, the user may be located at the user's residence in one state, while the assistant may be located at a residence or work location in a different state.

In some implementations, the user organizes a workspace **101** with tools, parts, and other objects that are required to complete an interactive session, for example based on a list presented to the user. The example workspace **101** includes a wrench **103***a*, a screwdriver **103***b*, and another screwdriver **103***c*. The workspace **101** also includes, for each object, an

indicator element **104***a*-**104***c* that is used to identify the object. The indicator elements **104***a*-**104***c* can also be placed near the objects by the user.

An indicator element **104***a*-**104***c* can include a visual code **106***a*, an indicator **108***a*, a control module **110***a*, and a wireless communication device **112***a*. An indicator element **104***a*-**104***c* can also include an energy source, such as a battery, for powering the indicator **108***a*-**108***c*, the control module **110***a*-**110***c*, and the wireless communication device **112***a*-**112***c*. The visual codes **106***a*-**106***c* can be QR codes, bar codes, numbers, alpha-numeric codes, or other types of identifiable objects. Typically, the visual code **106***a* for an indicator element **104***a* is unique to that indicator element **104***a*. In this way, each object **103***a*-**103***c* is associated with a unique visual code **106***a*-**106***c*, respectively. The indicator elements **104***a*-**104***c* can be configured to stand on the workspace **101** such that the visual codes **106***a*-**106***c* are visible to the video input device **134**.

The indicators **108***a*-**108***c* can include a light, such as a light-emitting diode (LED), a speaker, or other object that can be used to draw a user's attention to the indicator element **104***a*-**104***c*. As described below, when the assistant wants the user to make use of a particular object, such as the wrench **103***a*, the assistant can cause the indicator **108***a* to activate, drawing the user's attention to the object.

The wireless communication devices **112***a*-**112***c* are used to register their indicator elements **104***a*-**104***c* with the interactive session system **170**. To register with the interactive session system **170**, each wireless communication device **112***a*-**112***c* can send data identifying the indicator element **104***a*-**104***c* and/or the visual code **106***a*-**106***c* to the user device **130**. In turn, the user device **130** can provide the data to the interactive session system **170**.

Each indicator element **104***a*-**104***c* can have a unique identifier, e.g., ID number that uniquely identifies the indicator element **104***a*-**104***c*. This unique identifier can be sent to the interactive session system **170** during the registration process. For each indicator element **104***a*-**104***c*, the interactive session system **170** may store its identifier and/or its visual code so that the interactive session system **170** can associate the indicator element with the proper user interface element.

The wireless communication devices **112***a*-**112***c* are also used to receive a command signal for activating the indicators **108***a*-**108***c*. When the command signal is received by a wireless communication device **112***a*, the wireless communication device **112***a* provides a signal to its control module **110***a* indicating receipt of the command signal. In turn, the control module **110***a* activates the indicator **108***a*. The control modules **110***a*-**110***c* can be configured to activate their indicators **108***a*-**108***c* for a predetermined amount of time, or until a signal is received by the wireless communication device **112***a*-**112***c* to deactivate the indicator **108***a*-**108***c*.

The user interface generator **172** generates user interfaces, such as the example user interface **150**, and provides the user interfaces to production systems **140** of assistants, or other users. In general, the user interfaces enable assistants to select objects **103***a*-**103***c* in order to activate the indicator **108***a*-**108***c* associated with the object **103***a*-**103***c*. To generate a user interface, the user interface generator **172** receives an image or video feed of a workspace **101**, for example from the video input device **134** of the user device **130**. The image or video feed depicts the objects **103***a*-**103***c* arranged on the workspace **101** and the indicator elements **104***a*-**104***c* positioned near each of the objects **103***a*-**103***c*.

A user interface created by the user interface generator **172** can include an image or video of the workspace **101**, including the objects **103***a*-**103***c* and the indicator elements **104***a*-**104***c*. For example, the user interface **150** includes depictions of a wrench **151***a*, a screwdriver **151***b*, and another screwdriver **151***c*, which correspond to the wrench **103***a*, the screwdriver **103***b*, and the screwdriver **103***c* of the workspace **101**, respectively.

The user interface generator **172** also creates user interface elements **154***a*-**154***c* for each indicator element **104***a*-**104***c*. In general, a user interface element **154**-**154***c* enables the assistant to select the object **103***a*-**103***c* associated with the user interface element **154***a*-**154***c*, and cause the indicator **108***a* for the object **103***a*-**103***c* to activate. For example, if the assistant wanted the user to pick up the screwdriver **103***b*, the assistant could select the user interface element **154***b*. In turn, the production system **140** sends a command signal to the user device **130**, e.g., by way of the interactive session system **170**, and the user device **130** activates the indicator **108***b* by sending a command signal to the wireless communication device **112***b*. An example process for generating a user interface is illustrated in FIG. **4** and described below.

The example user interface elements **154**-**154***c* each includes a selectable icon **155***a* and optionally a depiction **156***a*-**156***c* of the visual code **106***a*-**106***c* for its corresponding indicator element **104***a*-**104***c*. When selected, a selectable icon **155***a* causes the production system **140** to send the command signal to the user device **130**. The selectable icons **155***a*-**155***c* can be selected by point and click using a mouse or other pointer, or by an assistant touching a touchscreen at the selectable icons **155***a*-**155***c*.

In some implementations, each user interface element **154***a*-**154***c* includes an "On" icon and an "Off" icon. This allows the assistant to selectively turn the indicators **108***a*-**108***c* on and off. For example, if the assistant selects an "On" icon for the wrench **103***a*, the production system **140** may send a command to the signal to the user device **130** to turn the indicator **108***a* on. Similarly, if the assistant selects the "Off" icon for the wrench **103***a*, the production system **140** may send a command to the signal to the user device **130** to turn the indicator **108***a* off.

The interactive session system **170** can maintain an index of user interface elements **154***a*-**154***c* in the user interface element index **176**. The user interface element index **176** can include data identifying each user interface element **154***a*-**154***c* included in a user interface **150** and, for each user interface element **154***a*-**154***c*, data identifying its corresponding indicator element **104***a*-**104***c*. For example, the data identifying an indicator element **104***a*-**104***c* may include the unique identifier for the indicator element **104***a*-**104***c*. This index can be used to map data identifying a selected user interface element **154***a*-**154***c* to its corresponding indicator element **104***a*-**104***c*.

The user interface generator **172** can generate user interfaces that accept other forms of input in addition to, or in place of, selectable icons. In some implementations, the production system **140** includes or is communicably coupled to an eye tracking device. The eye tracking device can determine the direction in which the assistant is looking and cause indicators **108***a*-**108***c* to activate based on this direction. For example, if the eye tracking device determines that the assistant is looking at the depiction of the wrench **151***a* in the user interface **150**, the production system **140** can use this data to cause the indicator **108***a* to activate.

The eye direction can be used in combination with other signals. For example, the eye direction may be used in

combination with a timer. If the production system **140** determines, in combination with the eye tracking device, that the assistant has been looking at the depiction of the wrench **151***a* for at least a threshold amount of time, e.g., two seconds, the production system **140** may cause the indicator **108***a* to activate. The eye direction may also be used in combination with a voice command, such as "activate." For example, while the assistant is looking at the depiction of the wrench **151***a*, the assistant may speak the command "activate." The production system **140** can detect the command, e.g., by way of the audio input device **142**, and in response, cause the indicator **108***a* to activate.

In some implementations, the production system **140** and/or the interactive session system **170** accepts voice commands without eye tracking. For example, voice associations between the assistant and the objects **151***a*-**151***c* depicted in the user interface **150** may be used to activate the indicators **108***a*-**108***c*. The voice associations can be learned before or during an interactive session. For example, during the interactive session, the assistant may say "pick up the ¾" wrench" and select the icon **155***a* for the wrench **103***a*. The interactive sessions system **170** can then associate the command "¾ wrench" or "pick up the ¾" wrench" with the user interface element **154***a*, and thus the indicator element **104***a*. Before the interactive session, the assistant can train the interactive session system **170** by selecting the appropriate icon **155***a*-**155***c* and recording a corresponding command. Thereafter, when a command associated with one of the indicator elements **155***a*-**155***c* is spoken, the production system **140** and/or the interactive session system **170** can cause the corresponding indicator **108***a*-**108***c* to activate. The voice associations for each user interface element **154***a*-**154***c* can also be stored in the user interface element index **176** with a reference to its corresponding user interface element **154***a*-**154***c*.

In some implementations, the user interface is based on a video feed of the workspace **101** rather than a still image. For example, the user interface generator **172** may receive a video feed from the user device **130**, generate user interface elements **154***a*-**154***c* for each indicator element **104***a*-**104***c* depicted in the video feed, and superimpose the user interface elements **154***a*-**154***c* on a reproduction of the video feed to create the user interface **150**. If the video input device **132** moves, the user interface generator **172** can also move the user interface elements **154***a*-**154***c* to keep them near the corresponding indicator elements **104***a*-**104***c* in the video feed.

The interactive session system **170** can also help train the user as to what each tool or part is. Before an interactive session begins, the user places the appropriate objects **103***a*-**103***c* and an indicator element **104***a*-**104***c* for each object on the workspace **101**. For each object, the user can record a description of the object using the audio input **132** of the user device **130**. For example, the interactive session system **170** may provide a user interface to the user device **130**. This user interface may include an icon that enables the user to select each indicator element **104***a*-**104***c* and record a description for the object associated with that indicator element. For example, the user interface may be similar to the user interface that is presented at the production system **140**. When the description is recorded, the interactive session system **170** can associate the description with its corresponding indicator element **104***a*-**104***c*. When the assistant selects an object during an interactive session, the interactive session system **170** can cause the user device **130** to play the description for the selected object. For example, the user may describe the screwdriver **103***c* as a "Philips-head screwdriver." When the assistant selects the user interface element **154***c* for the screwdriver **103***c*, the user will hear the recorded description "Philips-head screwdriver" played by the user device **130**, in addition to the indicator **108***c* for the screwdriver **103***c* being activated.

Using Laser(s) to Identify Objects

FIG. **2** is another example environment **200** in which an interactive session system **270** provides a user interface for identifying objects at a remote location. The environment **200** includes many components similar to those of the environment **100** of FIG. **1**. For example, the environment **200** includes a workspace **201** that includes objects **203***a*-**203***c* and indicator elements **204***a*-**204***c* that each includes a visual code **206***a*-**206***c*.

The environment **200** also includes a user device **230**, a production system **240**, an interactive session system **270**, and a network **290**, which can be substantially the same as or similar to the user device **130**, the production system **140**, the interactive session system **170**, and the network **190** of FIG. **1**, respectively. For example, the user device **230** includes an audio input device **232**, a video input device **234** and/or still image input device, an optional display device **238**, and/or optionally other input devices and output devices. Similarly, the production system **240** includes an audio input device **242**, a video input device **244**, a display device **246**, and optionally other input devices and production processes that are used to create sessions.

The interactive session system **270** includes a user interface generator **272**, an object identifier **274**, and user interface element index **276**. Similar to the interactive session **170** of FIG. **1**, the interactive session system **270** generates user interfaces, such as the user interface **250**, based on images or video feeds of the workspaces. The example user interface **250** included depictions of the tools **251***a*-**251***c* and user interface elements **254***a*-**254***c* that each includes a selectable icon **255***a*-**255***c* and optionally the visual code **256***a*-**256***c* of its corresponding indicator element **204***a*-**204***c*.

The example environment **200** also includes a laser system **260**. The laser system **260** includes a laser controller **261** and a laser **263**. The laser **263** is used to highlight objects or locations, e.g., a particular spot or place on a workspace, selected at the user interface **250** in place of, or in addition to, the use of indicator elements. To highlight an object or location, the laser controller **261** can cause the laser to pan and/or tilt until the laser **261** directs its beam at the selected object or location.

In operation, the production system **240** can transmit command data identifying a selected user interface element **254***a*-**254***c* or its corresponding indicator element **204***a*-**204***c* to the user device **230**, for example by way of the interactive session system **270**. In response, the user device **230** can interact with the laser controller **261** to direct the laser **263** at the object **203***a*-**203***c* that corresponds to the selected user interface element **254***a*-**254***c*.

A feedback loop can be used to help guide the laser **263** to the appropriate object **203***a*-**203***c*. In some implementations, the interactive session system **270**, or one of the other systems, can monitor the location of a dot or line produced by the laser's beam **265** on the workspace **201** as the laser **263** is guided into position. The location of the dot or line can be captured by the video input device **234** and displayed in the user interface **250**, as illustrated by the icon **267**.

As the laser **263** pans and tilts to redirect its beam **265**, the interactive session system **270** can compute the vertical and/or horizontal distance between the location of the dot or line and the destination at the selected object **203***a*-**203***c*.

These distances can be with respect to the user interface **250**. For example, the interactive session system **270** may compute the distances in terms of pixels. Based on the computed distances, the interactive session system **270** can provide data to the user device **230** to continue guiding the laser **263** to the selected object. Once the laser **263** is directed to the selected object, the interactive session system **270** can provide data to the user device **230** to cause the laser **263** to remain in that position.

The example user interface **250** illustrates the movement of the laser's beam **265** from a position **266** on the workspace **201** to its current position near the wrench **203***a*. In particular, the user interface **250** includes an icon **268** displaying the position **266** and the icon **267** displaying its current position.

Detecting a red laser dot can be difficult for some cameras as the cameras interpret the dot as a bright white light because it overloads the camera's sensor. To counteract this, two lasers can be used. For example, the two lasers, e.g., one green laser and one red laser, can be directed at the same position. If this position cannot be detected through the video feed, one of the lasers can be moved away from the original position and then moved back. If the movement of the laser from the original position is detected, for example by detecting another bright spot where the laser has been moved to, then the original position can be considered the location of the lasers. Two lasers can also be used to project a pattern that can be more readily recognized in the video feed. For example, two lasers may be used to project a crosshairs-like pattern onto the workspace **201**.

In some laser-based implementations, indicator elements **204***a*-**204***c* may be omitted. The user interface may display the workspace **201** and the objects **203***a*-**203***c*. To select one of the objects **203***a*-**203***c* or a location depicted by the user interface, the assistant may select a point on the user interface at or near a desired object **203***a*-**203***c* or location. For example, the assistant may touch a touchscreen at the desired location or click a mouse at the desired location. In response, the production system **240** may interact with the interactive session system **270** and/or the user device **230** to direct the laser **263** at a location of the workspace **201** that corresponds to the selected location of the user interface **250**. For example, if the assistant selects the user interface **250** at the depiction **251***c* of the screwdriver **203***c*, the production system **240** may interact with the interactive session system **270** and/or the user device **230** to direct the laser **263** at the screwdriver **203***c*. A feedback loop can be used as described above to direct the laser **263** to the screwdriver **203***c*.

Example Process for Generating an Image of a Workspace

FIG. **3** is a flow chart of an example process **300** for capturing an image of a workspace and sending the image to an interactive session system. Operations of the process **300** can be implemented, for example, by one or more data processing apparatus, such as the user device **130** of FIG. **1** or the user device **230** of FIG. **2**. The process **300** can also be implemented as instructions stored on computer storage medium such that execution of the instructions by a data processing apparatus cause the data processing apparatus to perform the operations of the process **300**.

Objects and indicator elements are arranged on a workspace or other location (**302**). For example, a user planning to participate in an interactive session may be presented with a list of tools, parts, and other objects that are required for the interactive session. The user may place the objects specified by the list on the workspace.

The user may also place an indicator element, similar to the indicator element **104***a* of FIG. **1** or the indicator element **204***a* of FIG. **2**, near each object on the workspace. For example, the user may have received a set of indicator elements for use in interactive sessions. As the user interface generator **172** associates the indicator elements with user interface elements irrespective of the identity of the objects, the user can randomly place the indicator elements near the objects. That is, the user does not have to place a certain indicator element near a particular object.

An image is captured of the workspace, including the objects and the indicator elements (**304**). For example, the user may use the video input device **132** of the user device **130** to capture a still image of the workspace. The user device **130** sends the captured image to the interactive session system **170** (**306**).

In some implementations, rather than sending a still image to the interactive session system **170**, the user device **130** may provide a video feed to the interactive session system **170**. The interactive session system **170** can capture a still image of the workspace from the video feed. Or, the interactive session system may create the user interface using the video feed rather than a still image.

Example Process for Generating a User Interface

FIG. **4** is a flow chart of an example process **400** for generating a user interface depicting a workspace and user interface elements for objects included in the workspace. Operations of the process **400** can be implemented, for example, by one or more data processing apparatus, such as the interactive session system **170** of FIG. **1** or the interactive session system **270** of FIG. **2**. The process **400** can also be implemented as instructions stored on computer storage medium such that execution of the instructions by a data processing apparatus cause the data processing apparatus to perform the operations of the process **400**. For ease of discussion, the process is described with reference to the interactive session system **170** and the environment **100**.

An image of a workspace, such as the workspace **101**, is received (**402**). For example, the interactive session system **170** may receive the image from the user device **130** as described above with reference to FIG. **3**. The image may depict objects **103***a*-**103***c* and indicator elements **104***a*-**104***c* arranged on the workspace **101**. The image may also depict the visual codes **106***a*-**106***c* of the indicator elements **104***a*-**104***c*.

Data identifying indicator elements **104***a*-**104***c* included in the workspace are received (**404**). As described above, the indicator elements **104***a*-**104***c* include wireless communication devices **112***a*-**112***c*, respectively. When active, e.g., powered on, each wireless communication device **112***a*-**112***c* may transmit data identifying its indicator element **104***a*-**104***c*, for example to the user device **130** during a registration process. In turn, the user device **130** can provide the received data to the interactive session system **170**. The data identifying the indicator element **104***a*-**104***c* can include its unique identifier.

The visual codes **106***a*-**106***c* of the indicator elements are identified from the image (**406**). For example, the user interface generator **172**, or another subsystem, can process the image to identify each visual code **106***a*-**106***c* in the image. The user interface generator **172** can generate a list of visual codes found in the image. If the visual codes are QR codes or barcodes, the unique identifier for the indicator element **104***a*-**104***c* may be stored in the code. When the code is scanned, the user interface generator **172** can receive the unique identifier and generate a list of unique identifiers for the workspace **101**.

A user interface element **154***a*-**154***c* is generated for each visual code **106***a*-**106***c* identified in the image (**408**). As described above, a user interface element **154***a*-**154***c* can be used to activate the indicator **108***a*-**108***c* of an indicator element **104***a*-**104***c*. For each visual code **106***a*-**106***c*, the user interface generator **172** can generate a user interface element **154***a*-**154***c* that includes a selectable icon **155***a*-**155***c* that allows an assistant to activate the indicator **108***a*-**108***c*.

The user interface elements **154***a*-**154***c* are associated with their corresponding indicator elements **104***a*-**104***c* (**410**). As each indicator element **104***a*-**104***c* is associated with a unique identifier, the user interface generator **172** can associate each user interface element **104***a*-**104***c* with the unique identifier of the appropriate indicator element **154***a*-**154***c*. For example, the user interface generator **172** may associate the unique identifier for the indicator element **154***a* with the user interface element **104***a*. Similarly, the user interface generator **172** may associate the unique identifier for the indicator element **154***b* with the user interface element **104***b*. In this way, when a user interface element **154***a*-**154***c* is selected, the interactive session system **170** can identify the appropriate indicator element for activation.

A user interface is generated (**412**). The user interface generator **172** can generate a user interface based on the received image and the generated user interface elements **154***a*-**154***c*. For example, the user interface generator **172** can generate a user interface that depicts the objects **103***a*-**103***c* included in the workspace **101** and the user interface elements **154***a*-**154***c*, similar to the user interface **150** of FIG. **1**.

The user interface elements **154***a*-**154***c* can be disposed near their corresponding indicator elements **104***a*-**104***c* and/or near their corresponding objects **103***a*-**103***c*. In the example user interface **150**, the indicator element **154***a* is positioned below its corresponding object, the wrench **103***a*. Similarly, the indicator element **154***b* is positioned below its corresponding object, the screwdriver **103***b*.

Once generated, the user interface **150** may be transmitted to the production system **140**. The expert assistance can then activate indicators **108***a*-**108***c* by selecting the corresponding user interface elements **154***a*-**154***c* at the user interface **150**.

Example Process for Activating an Indicator

FIG. **5** is a flow chart of an example process **500** for activating an indicator for an object. Operations of the process **500** can be implemented, for example, by one or more data processing apparatus, such as the production system **140** and/or the user device **130**. The process **500** can also be implemented as instructions stored on computer storage medium such that execution of the instructions by a data processing apparatus cause the data processing apparatus to perform the operations of the process **500**.

Selection data specifying selection of a user interface element is received (**502**). For example, the production system **140** may present a user interface, such as the user interface **150** that depicts objects **151***a*-**151***c* of a workspace **101** and user interface elements **154***a*-**154***c*. The assistant may select one of the user interface elements **154***a*-**154***c*, for example using a mouse or touching a touchscreen at the user interface element **154***a*-**154***c*. In turn, the production system **140** can receive data from the user interface **150** that identifies the selected user interface element **154***a*-**154***c*.

Command data for activating an indicator is transmitted (**504**). In response to receiving the data specifying a selection of a user interface element **154***a*-**154***c*, the production system **140** can send command data to the user device **130**. For example, the production system **140** may send the command data to the user device **130** by way of the interactive session system **170**, or directly to the user device **130** bypassing the interactive session system **170**.

The command data can identify the selected user interface element **154***a*-**154***c* and/or a unique identifier of an indicator element **104***a*-**104***c* that corresponds to the selected user interface element **154***a*-**154***c*. For example, the production system **140** may receive, for the user interface **159** and from the user interface element index **176**, an index that identifies each user interface element **154***a*-**154***c* of the user interface **150** and for each user interface element **154***a*-**154***c*, the indicator element **104***a*-**104***c* that corresponds to the user interface element **154***a*-**154***c*. This index would specify that the user interface element **154***a* corresponds to the indicator element **104***a*.

By way of another example, the production system **140** can send command data that specifies the selected user interface element **154***a*-**154***c* to the interactive session system **170**. In turn, the interactive session system **170** can access the user interface element index **176** to identify the indicator element **104***a*-**104***c* that corresponds to the selected user interface element **154***a*-**154***c*.

By way of yet another example, the production system **140** can send command data identifying the visual code **108***a*-**108***c* associated with the selected user interface element **154***a*-**154***c* to the interactive session system **170**. The interactive session system **170** can determine the corresponding indicator element **104***a*-**104***c* based on the identified visual code.

The command data is received (**506**). For example, the user device **130** may receive the command data from the production system **140** and/or the interactive session system **170**. If the command data specifies the selected user interface element **154***a*-**154***c*, rather than its corresponding indicator element **104***a*-**104***c*, the user device **130** can identify the corresponding indicator element **104***a*-**104***c* using the user interface element index **176** and the information identifying the selected user interface element **154***a*-**154***c*. For example, the user device **130** can compare the selected user interface element **154***a*-**154***c* to the user interface element index **176** to identify the corresponding indicator element.

In response to receiving the command data, the user device **130** causes the indicator **108***a*-**108***c* of the indicator element **104***a*-**104***c* that corresponds to the selected user interface element **154***a*-**154***c* to activate (**508**). To activate the indicator **108***a*-**108***c*, the user device **130** can send command data to the wireless communication device **112***a*-**112***c* of the indicator element **104***a*-**104***c*. For example, if the assistant selected the user interface element **154***c* for the screwdriver **103***c*, the user device **130** can send command data to the wireless communication device **112***c*. In turn, the wireless communication device **112***c* can send data to the control module **110***c* and the control module **110***c* can activate the indicator **108***c*.

Example Process for Identifying an Object with a Laser

FIG. **6** is a flow chart of an example process **600** for highlighting an object or location with a laser. Operations of the process **600** can be implemented, for example, by one or more data processing apparatus, such as the production system **240**, the user device **230**, and/or the interactive session system **270**. The process **600** can also be implemented as instructions stored on computer storage medium such that execution of the instructions by a data processing apparatus cause the data processing apparatus to perform the operations of the process **600**.

Selection data specifying a selection at a user interface is received (**602**). An assistant may select a point on the user interface that corresponds to an object or desired area to which the assistant wants to direct a user's attention. For example, the assistant may touch a touchscreen at the location of the depiction **251***c* of the screwdriver **203***c* in the user interface **250**. By way of another example, the assistant may select a user interface element **254***a*-**254***c* for an object. By way of yet another example, the assistant may select a point on the user interface that corresponds to a place at the workspace where the assistant wants the user to place an object. The production system **240** may receive the selection data identifying the location of the selection and provide data specifying the location to the interactive session system **270**.

Command data specifying a direction for a laser to move is transmitted (**604**). For example, the interactive session system **270** may have information identifying the current direction in which the laser is pointing based on detecting a dot made by the laser's beam on the workspace **201**. The interactive session system **270** can compute the vertical and horizontal distance between the current position of the laser's beam and the position identified by the selection data. Based on the computed distances, the interactive session system **270** can determine the direction in which the laser needs to move in order to direct its beam at a location of the workspace **201** that corresponds to the location selected at the user interface **250**. The interactive session system **270** can provide command data specifying the direction for the laser to move to the user device **230**.

The laser **263** is moved in the specified direction (**606**). The user device **230** can interact with the laser controller **261** to move the laser **263** in the specified direction. In response, the laser controller **261** can cause the laser **263** to move in the specified direction.

The position of a dot produced by the laser's beam on the workspace is detected (**608**). The position may be detected by the interactive session system **270** periodically while the laser **263** is being moved in the specified direction. The position of the dot can be determined based on its depiction in the video feed received from the video input device **234** of the user device **230**.

A determination is made whether the dot produced by the laser's beam is at the selected position (**610**). The determination can be made by the interactive session system **270** comparing the location of the dot produced by the laser's beam to the location of the user interface selected by the assistant.

If it is determined that the dot produced by the laser's beam is at the selected position, command data is sent to cause the laser **263** to maintain its current position (**612**). For example, the interactive session system **270** may send command data to the user device **130** to maintain the laser's current position. In turn, the user device **230** can interact with the laser controller **261** to maintain the laser's current position.

If it is determined that the dot produced by the laser **263** is not located at the selected position, the direction for the laser **263** to move can be updated to direct the laser **263** at the selected location (**614**). For example, the interactive session system **270** can re-compute the vertical and horizontal distances between the current position of the laser's beam and the position identified by the selection data. Based on the computed distances, the interactive session system **270** can update the direction for the laser **263** to move.

Updated command data can be transmitted (**616**). The updated command data can include the updated direction for the laser **263** to move. The interactive session system **270** can send the updated command data to the user device **230**. In response, the user device **230** can interact with the laser controller **261** to move the laser **263** in the specified direction.

Additional Implementation Details

Embodiments of the subject matter and the operations described in this specification can be implemented in digital electronic circuitry, or in computer software, firmware, or hardware, including the structures disclosed in this specification and their structural equivalents, or in combinations of one or more of them. Embodiments of the subject matter described in this specification can be implemented as one or more computer programs, i.e., one or more modules of computer program instructions, encoded on computer storage medium for execution by, or to control the operation of, data processing apparatus. Alternatively or in addition, the program instructions can be encoded on an artificially-generated propagated signal, e.g., a machine-generated electrical, optical, or electromagnetic signal, that is generated to encode information for transmission to suitable receiver apparatus for execution by a data processing apparatus. A computer storage medium can be, or be included in, a computer-readable storage device, a computer-readable storage substrate, a random or serial access memory array or device, or a combination of one or more of them. Moreover, while a computer storage medium is not a propagated signal, a computer storage medium can be a source or destination of computer program instructions encoded in an artificially-generated propagated signal. The computer storage medium can also be, or be included in, one or more separate physical components or media (e.g., multiple CDs, disks, or other storage devices).

The operations described in this specification can be implemented as operations performed by a data processing apparatus on data stored on one or more computer-readable storage devices or received from other sources.

The term "data processing apparatus" encompasses all kinds of apparatus, devices, and machines for processing data, including by way of example a programmable processor, a computer, a system on a chip, or multiple ones, or combinations, of the foregoing The apparatus can include special purpose logic circuitry, e.g., an FPGA (field programmable gate array) or an ASIC (application-specific integrated circuit). The apparatus can also include, in addition to hardware, code that creates an execution environment for the computer program in question, e.g., code that constitutes processor firmware, a protocol stack, a database management system, an operating system, a cross-platform runtime environment, a virtual machine, or a combination of one or more of them. The apparatus and execution environment can realize various different computing model infrastructures, such as web services, distributed computing and grid computing infrastructures.

A computer program (also known as a program, software, software application, script, or code) can be written in any form of programming language, including compiled or interpreted languages, declarative or procedural languages, and it can be deployed in any form, including as a stand-alone program or as a module, component, subroutine, object, or other unit suitable for use in a computing environment. A computer program may, but need not, correspond to a file in a file system. A program can be stored in a portion of a file that holds other programs or data (e.g., one or more scripts stored in a markup language document), in a single file dedicated to the program in question, or in multiple coordinated files (e.g., files that store one or more modules,

sub-programs, or portions of code). A computer program can be deployed to be executed on one computer or on multiple computers that are located at one site or distributed across multiple sites and interconnected by a communication network.

The processes and logic flows described in this specification can be performed by one or more programmable processors executing one or more computer programs to perform actions by operating on input data and generating output. The processes and logic flows can also be performed by, and apparatus can also be implemented as, special purpose logic circuitry, e.g., an FPGA (field programmable gate array) or an ASIC (application-specific integrated circuit).

Processors suitable for the execution of a computer program include, by way of example, both general and special purpose microprocessors, and any one or more processors of any kind of digital computer. Generally, a processor will receive instructions and data from a read-only memory or a random access memory or both. The essential elements of a computer are a processor for performing actions in accordance with instructions and one or more memory devices for storing instructions and data. Generally, a computer will also include, or be operatively coupled to receive data from or transfer data to, or both, one or more mass storage devices for storing data, e.g., magnetic, magneto-optical disks, or optical disks. However, a computer need not have such devices. Moreover, a computer can be embedded in another device, e.g., a mobile telephone, a personal digital assistant (PDA), a mobile audio or video player, a game console, a Global Positioning System (GPS) receiver, or a portable storage device (e.g., a universal serial bus (USB) flash drive), to name just a few. Devices suitable for storing computer program instructions and data include all forms of non-volatile memory, media and memory devices, including by way of example semiconductor memory devices, e.g., EPROM, EEPROM, and flash memory devices; magnetic disks, e.g., internal hard disks or removable disks; magneto-optical disks; and CD-ROM and DVD-ROM disks. The processor and the memory can be supplemented by, or incorporated in, special purpose logic circuitry.

To provide for interaction with a user, embodiments of the subject matter described in this specification can be implemented on a computer having a display device, e.g., a CRT (cathode ray tube) or LCD (liquid crystal display) monitor, for displaying information to the user and a keyboard and a pointing device, e.g., a mouse or a trackball, by which the user can provide input to the computer. Other kinds of devices can be used to provide for interaction with a user as well; for example, feedback provided to the user can be any form of sensory feedback, e.g., visual feedback, auditory feedback, or tactile feedback; and input from the user can be received in any form, including acoustic, speech, or tactile input. In addition, a computer can interact with a user by sending documents to and receiving documents from a device that is used by the user; for example, by sending web pages to a web browser on a user's client device in response to requests received from the web browser.

Embodiments of the subject matter described in this specification can be implemented in a computing system that includes a back-end component, e.g., as a data server, or that includes a middleware component, e.g., an application server, or that includes a front-end component, e.g., a client computer having a graphical user interface or a Web browser through which a user can interact with an implementation of the subject matter described in this specification, or any combination of one or more such back-end, middleware, or front-end components. The components of the system can be interconnected by any form or medium of digital data communication, e.g., a communication network. Examples of communication networks include a local area network ("LAN") and a wide area network ("WAN"), an internetwork (e.g., the Internet), and peer-to-peer networks (e.g., ad hoc peer-to-peer networks).

The computing system can include clients and servers. A client and server are generally remote from each other and typically interact through a communication network. The relationship of client and server arises by virtue of computer programs running on the respective computers and having a client-server relationship to each other. In some embodiments, a server transmits data (e.g., an HTML page) to a client device (e.g., for purposes of displaying data to and receiving user input from a user interacting with the client device). Data generated at the client device (e.g., a result of the user interaction) can be received from the client device at the server.

While this specification contains many specific implementation details, these should not be construed as limitations on the scope of any inventions or of what may be claimed, but rather as descriptions of features specific to particular embodiments of particular inventions. Certain features that are described in this specification in the context of separate embodiments can also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable subcombination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a subcombination or variation of a subcombination.

Similarly, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. In certain circumstances, multitasking and parallel processing may be advantageous. Moreover, the separation of various system components in the embodiments described above should not be understood as requiring such separation in all embodiments, and it should be understood that the described program components and systems can generally be integrated together in a single software product or packaged into multiple software products.

Thus, particular embodiments of the subject matter have been described. Other embodiments are within the scope of the following claims. In some cases, the actions recited in the claims can be performed in a different order and still achieve desirable results. In addition, the processes depicted in the accompanying figures do not necessarily require the particular order shown, or sequential order, to achieve desirable results. In certain implementations, multitasking and parallel processing may be advantageous.

What is claimed is:

1. A method performed by data processing apparatus, the method comprising:

generating, using an image of a first location, a user interface that depicts the first location and enables a user to select from two or more areas of the first location to which to direct a light source, the generating comprising:

identifying, in the image of the first location, a respective visual code for each of the two or more areas; and

generating and presenting, in the user interface, a respective selectable icon adjacent to each of the two more areas based on the identified visual codes;

receiving selection data specifying a selection, at the user interface, of a selectable icon for a given area of the two or more areas of the first location, the selection being made at a second location different from the first location; and

causing a light source to direct light towards the given area of the first location in response to receiving the selection data.

2. The method of claim **1**, wherein causing the light source to direct light towards the given area of the first location comprises activating a light located in the given area of the first location.

3. The method of claim **1**, wherein the light source comprises a laser.

4. The method of claim **3**, further comprising:

detecting, in the user interface, a location of a laser beam output by the laser;

determining that the location of the laser beam in the user interface is not within an area of the user interface that matches the given area of the first location; and

causing the laser to move the laser beam towards the given area of the first location until the location of the laser beam in the user interface is within the area of the user interface that matches the given area of the first location.

5. The method of claim **1**, wherein receiving the selection data comprises:

determining that a user viewed a depiction of the given area in the user interface for at least a threshold amount of time; and

generating the selection data in response to determining that the user viewed the depiction of the given area in the user interface for at least the threshold amount of time.

6. The method of claim **1**, wherein receiving the selection data comprises:

receiving a voice command to highlight an area of the first location;

determining that a user was viewing a depiction of the given area at a time that the voice command was received; and

generating the selection data specifying a selection of the given area in response to the voice command and in response to determining that the user was viewing the depiction of the given area at the time that the voice command was received.

7. A system, comprising:

a data processing apparatus; and

a memory storage apparatus in data communication with the data processing apparatus, the memory storage apparatus storing instructions executable by the data processing apparatus and that upon such execution cause the data processing apparatus to perform operations comprising:

generating, using an image of a first location, a user interface that depicts the first location and enables a user to select from two or more areas of the first location to which to direct a light source, the generating comprising:

identifying, in the image of the first location, a respective visual code for each of the two or more areas; and

generating and presenting, in the user interface, a respective selectable icon adjacent to each of the two more areas based on the identified visual codes;

receiving selection data specifying a selection, at the user interface, of a selectable icon for a given area of the two or more areas of the first location, the selection being made at a second location different from the first location; and

causing a light source to direct light towards the given area of the first location in response to receiving the selection data.

8. The system of claim **7**, wherein causing the light source to direct light towards the given area of the first location comprises activating a light located in the given area of the first location.

9. The system of claim **7**, wherein the light source comprises a laser.

10. The system of claim **7**, wherein the operations further comprise:

detecting, in the user interface, a location of a laser beam output by the laser;

determining that the location of the laser beam in the user interface is not within an area of the user interface that matches the given area of the first location; and

causing the laser to move the laser beam towards the given area of the first location until the location of the laser beam in the user interface is within the area of the user interface that matches the given area of the first location.

11. The system of claim **7**, wherein receiving the selection data comprises:

determining that a user viewed a depiction of the given area in the user interface for at least a threshold amount of time; and

generating the selection data in response to determining that the user viewed the depiction of the given area in the user interface for at least the threshold amount of time.

12. The system of claim **7**, wherein receiving the selection data comprises:

receiving a voice command to highlight an area of the first location;

determining that a user was viewing a depiction of the given area at a time that the voice command was received; and

generating the selection data specifying a selection of the given area in response to the voice command and in response to determining that the user was viewing the depiction of the given area at the time that the voice command was received.

13. A non-transitory computer storage medium encoded with a computer program, the program comprising instructions that when executed by a data processing apparatus cause the data processing apparatus to perform operations comprising:

generating, using an image of a first location, a user interface that depicts the first location and enables a user to select from two or more areas of the first location to which to direct a light source, the generating comprising:

identifying, in the image of the first location, a respective visual code for each of the two or more areas; and

generating and presenting, in the user interface, a respective selectable icon adjacent to each of the two more areas based on the identified visual codes;

receiving selection data specifying a selection, at the user interface, of a selectable icon for a given area of the two or more areas of the first location, the selection being made at a second location different from the first location; and

causing a light source to direct light towards the given area of the first location in response to receiving the selection data.

14. The non-transitory computer storage medium of claim **13**, wherein causing the light source to direct light towards the given area of the first location comprises activating a light located in the given area of the first location.

15. The non-transitory computer storage medium of claim **13**, wherein the light source comprises a laser.

16. The non-transitory computer storage medium of claim **13**, wherein the operations further comprise:

detecting, in the user interface, a location of a laser beam output by the laser;

determining that the location of the laser beam in the user interface is not within an area of the user interface that matches the given area of the first location; and

causing the laser to move the laser beam towards the given area of the first location until the location of the laser beam in the user interface is within the area of the user interface that matches the given area of the first location.

17. The non-transitory computer storage medium of claim **13**, wherein receiving the selection data comprises:

determining that a user viewed a depiction of the given area in the user interface for at least a threshold amount of time; and

generating the selection data in response to determining that the user viewed the depiction of the given area in the user interface for at least the threshold amount of time.

18. The non-transitory computer storage medium of claim **13**, wherein receiving the selection data comprises:

receiving a voice command to highlight an area of the first location;

determining that a user was viewing a depiction of the given area at a time that the voice command was received; and

generating the selection data specifying a selection of the given area in response to the voice command and in response to determining that the user was viewing the depiction of the given area at the time that the voice command was received.

* * * * *